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Kim

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(54) **WASHING MACHINE AND CONTROL METHOD THEREOF**

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(52) **U.S. Cl.** ..... **68/17 R**; 68/207

(58) **Field of Classification Search** ..... 68/17 R, 68/207 R

See application file for complete search history.

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(57) **ABSTRACT**

A washing machine and control method thereof is provided, by which a bleaching agent and a fabric softener are supplied to the washing machine using a single water supply valve. The washing machine includes a first water supply valve for supplying water to a tub upon input of a wash command; and a second water supply valve for supplying water to the tub upon input of the wash command and upon a determination of a final rinse step; a detergent reservoir, coupled to the first water supply valve, for receiving a detergent for a wash step; a bleaching agent reservoir, coupled to the second water supply valve, for receiving a bleaching agent for the wash step; and a fabric softener reservoir, coupled to the bleaching agent reservoir, for receiving a fabric softener for a final rinse step, wherein the first water supply valve is used as a dedicated valve for the detergent and said second water supply valve is used as a common input valve for the bleaching agent and fabric softener, to introduce the detergent and bleaching agent to the water in the tub for the wash step and to introduce the fabric softener to the water in the tub for the final rinse step only. The method includes steps of determining a water level; supplying water to a tub according to the determined water level, by turning on the first and second water supply valves simultaneously and turning off the second water supply valve after a first predetermined time; performing a wash step and at least one rinse step according to a selected wash course based on the determined water level; determining a final rinse step among the at least one rinse step; and performing the final rinse step according to the determined water level, by turning on the first and second water supply valves simultaneously and turning off the second water supply valve after a second predetermined time. The final rinse performing step makes use of a siphonic effect applied to the fabric softener reservoir after performing the wash step.

22 Claims, 3 Drawing Sheets

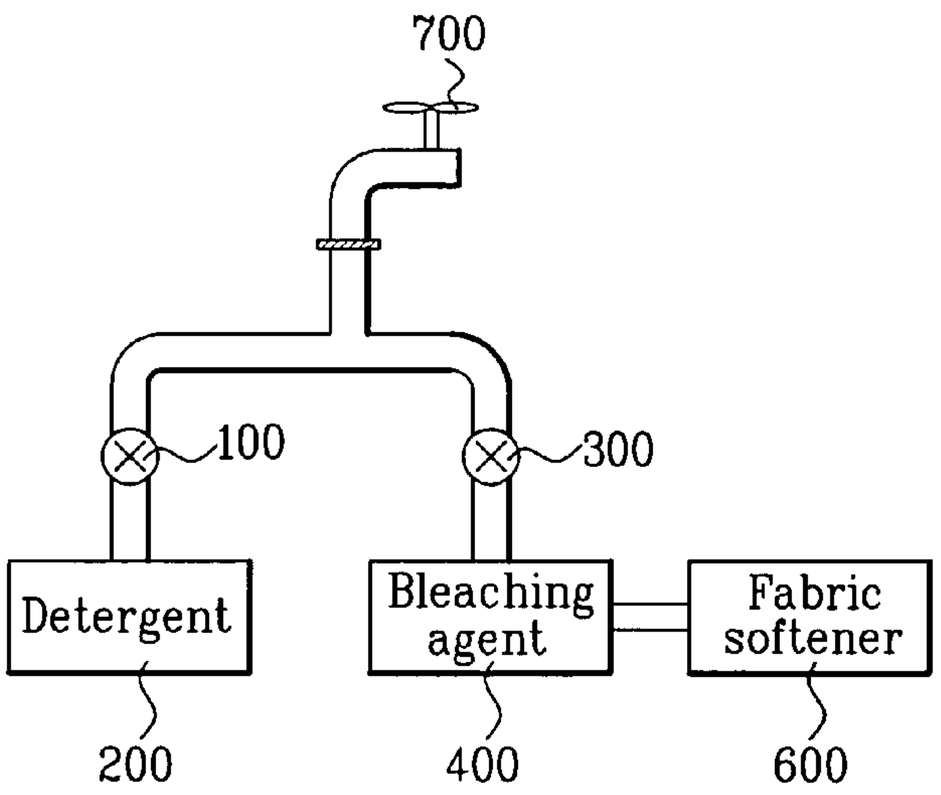

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FIG. 1
Related Art

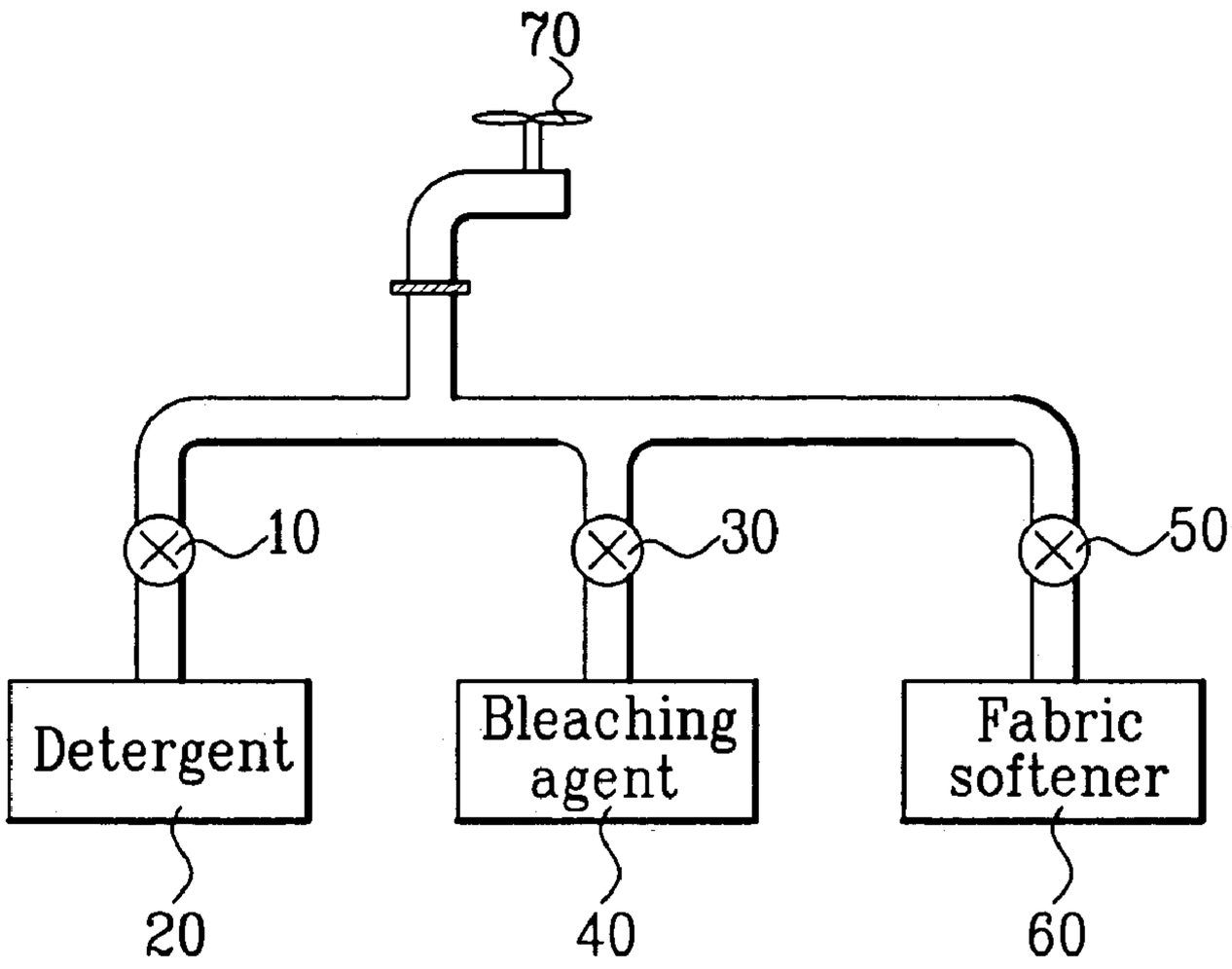


FIG. 2

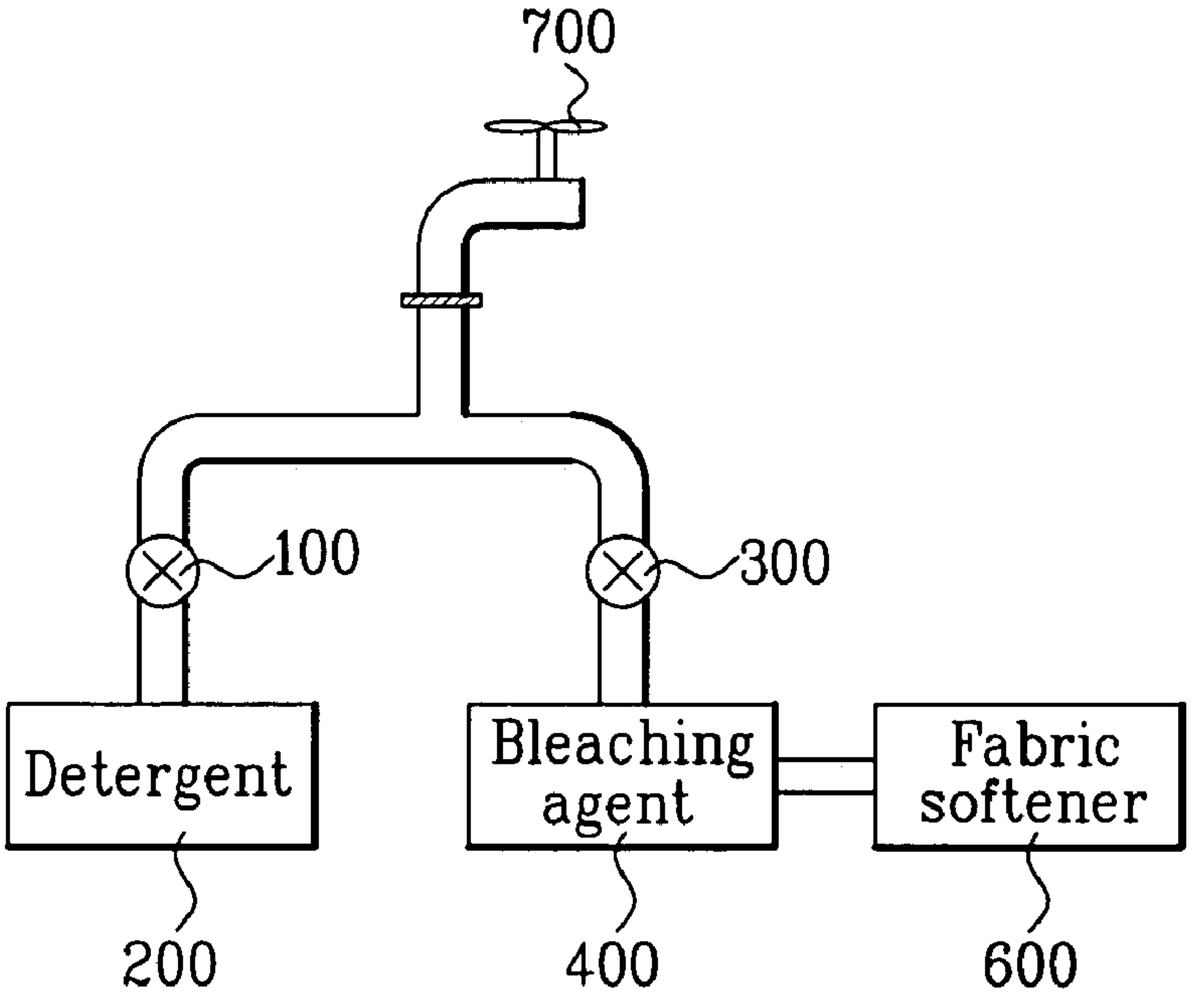


FIG. 3A

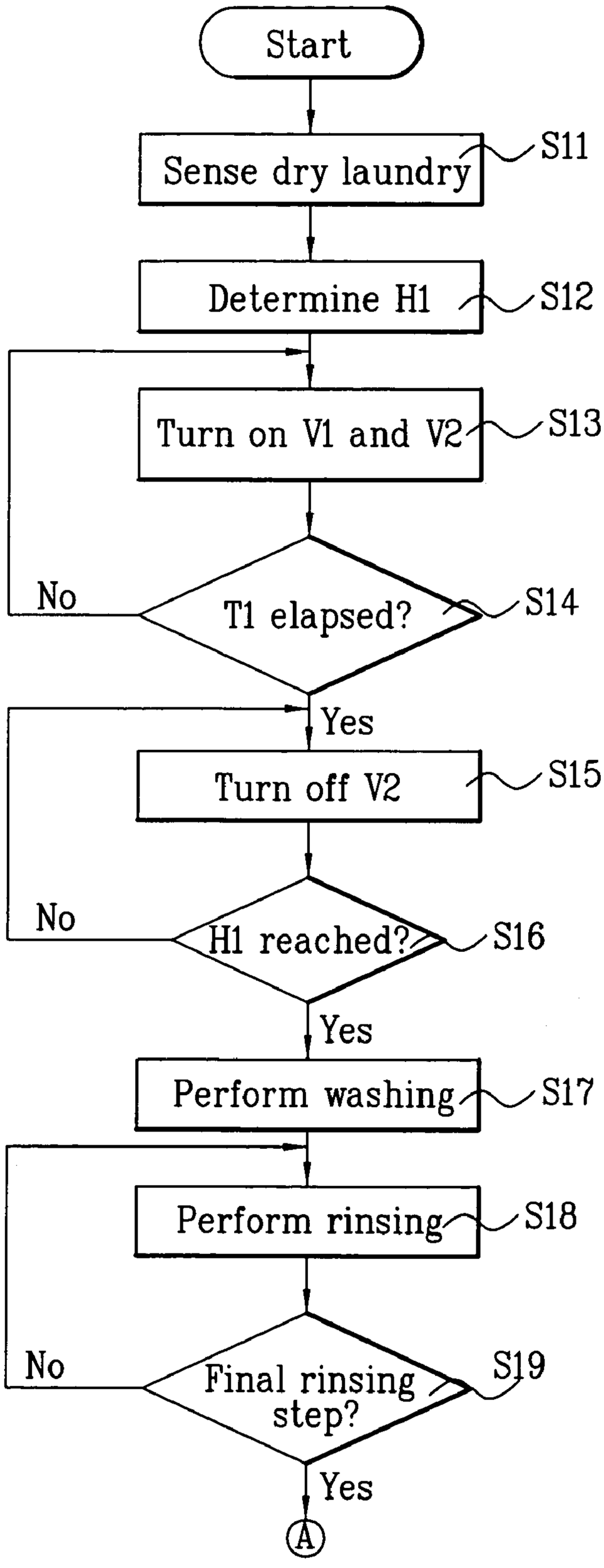
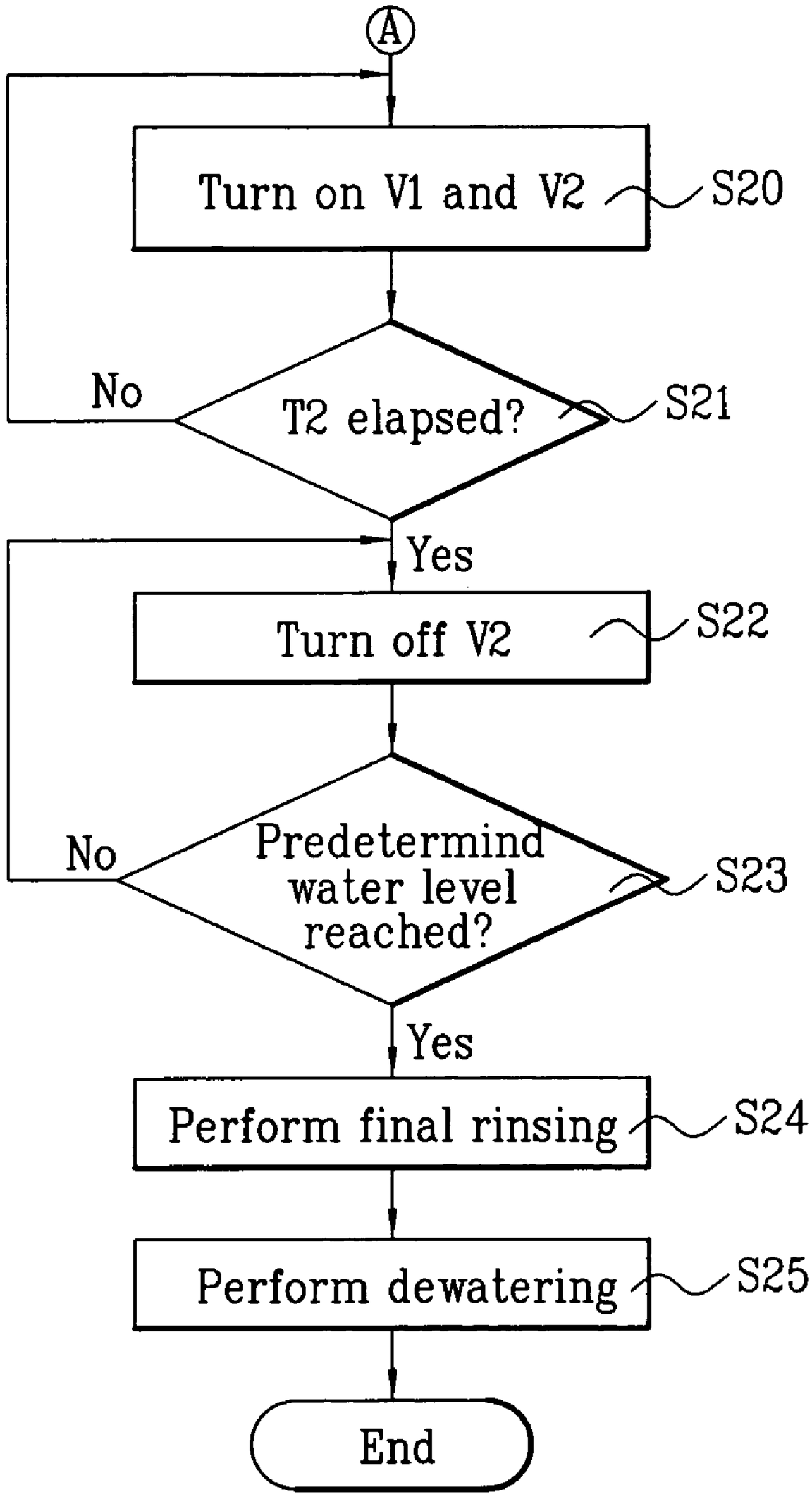

Start
Sense dry laundry
S11
Determine H1
S12
Turn on V1 and V2
S13
No
T1 elapsed?
S14
Yes
Turn off V2
S15
No
H1 reached?
S16
Yes
Perform washing
S17
Perform rinsing
S18
No
Final rinsing step?
S19
Yes
A

FIG. 3B


A
Turn on V1 and V2
S20
No
T2 elapsed?
S21
Yes
Turn off V2
S22
No
Predetermind water level reached?
S23
Yes
Perform final rinsing
S24
Perform dewatering
S25
End

WASHING MACHINE AND CONTROL METHOD THEREOF

This application claims the benefit of Korean Application No. 10-2002-0073856 filed on Nov. 26, 2002, which is hereby incorporated by reference.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a washing machine, and more particularly, to a washing machine and control method thereof enabling to supply a bleaching agent and a fabric softener using one supply valve.

2. Discussion of the Related Art

In a general washing machine for washing laundry, a tub is filled with washing and rinsing water from a domestic service pipe via a main supply valve, which is typically provided at the rear of the washing machine and is situated above the tub to enable a gravity feed of the water. Meanwhile, a detergent, bleaching agent, and fabric softener may be selectively supplied together with the water according to a predetermined pattern, to thereby be introduced to the water filling the tub to perform a wash step and at least one rinse step of a selected wash course. To do so, commercially available detergents are readily dissolvable in water, and most bleaching agents and fabric softeners are sold in liquid form.

FIG. **1** illustrates a water supply system of a washing machine according to a related art is controlled by a control circuit (not shown) to fill a tub (not shown) with washing and rinsing water from a domestic service pipe **70**. The water supply system includes means for selectively supplying detergent, bleaching agent, and fabric softener together with the water supply.

Referring to FIG. **1**, the water supply system is comprised of a first, second, and third water supply valves **10**, **30**, and **50** for transmitting water from the domestic service pipe **70** to a detergent reservoir **20**, a bleaching agent reservoir **40**, and a fabric softener reservoir **60**, respectively. The first and second water supply valves **10** and **30** are turned on when initiating a wash step, transmitting water to the detergent and bleaching agent reservoirs **20** and **40**, respectively, such that the water, detergent, and bleaching agent are mixed together to be supplied to the tub. Washing is performed with the water reaches a predetermined level, and a predetermined number of rinse cycles are performed after completion of the wash step. Upon reaching the final rinse cycle but before filling the tub to the predetermined level for performing the final rinsing, the third water supply valve **50** is turned on to transmit water to the fabric softener reservoir **60**, to perform final rinsing with fabric softener in the water. A dewatering step completes the wash course.

The above-described washing machine according to the related art, however, needs the first and second water supply valves connected to the detergent and bleaching agent reservoirs, respectively, despite the detergent and bleaching agent being simultaneously supplied at the beginning of the washing cycle, which increases product cost accordingly.

SUMMARY OF THE INVENTION

Accordingly, the present invention is directed to a washing machine and control method thereof that substantially obviates one or more of the problems due to limitations and disadvantages of the related art.

An object of the present invention, which has been devised to solve the foregoing problem, lies in providing a washing machine and control method thereof, by which a bleaching agent and a fabric softener are supplied to the washing machine using a single water supply valve.

Additional features and advantages of the invention will be set forth in the description which follows, and in part will be apparent to those having ordinary skill in the art upon examination of the following or may be learned from a practice of the invention. The objectives and other advantages of the invention will be realized and attained by the subject matter particularly pointed out in the specification and claims hereof as well as in the appended drawings.

To achieve these objects and other advantages in accordance with the present invention, as embodied and broadly described herein, there is provided a washing machine comprising a first water supply valve for supplying water to a tub upon input of a wash command; and a second water supply valve for supplying water to the tub upon input of the wash command and upon a determination of a final rinse step; a detergent reservoir, coupled to the first water supply valve, for receiving a detergent for a wash step; a bleaching agent reservoir, coupled to the second water supply valve, for receiving a bleaching agent for the wash step; and a fabric softener reservoir, coupled to the bleaching agent reservoir, for receiving a fabric softener for a final rinse step. According to the present invention, the first water supply valve is used as a dedicated valve for the detergent, and the second water supply valve is used as a common input valve for the bleaching agent and fabric softener. Thus, the detergent and bleaching agent are introduced to the water in the tub for the wash step, and the fabric softener is introduced to the water in the tub for the final rinse step only.

Preferably, the second predetermined time is longer than the first predetermined time.

The present invention makes use of a typical wash pattern, whereby a bleaching agent is supplied together with a detergent for a wash step and a fabric softener is supplied only for a final rinse step.

In another aspect of the present invention, there is provided a method of controlling a washing machine having first and second water supply valves. The method comprises steps of determining a water level; supplying water to a tub according to the determined water level, by turning on the first and second water supply valves simultaneously and turning off the second water supply valve after a first predetermined time; performing a wash step and at least one rinse step according to a selected wash course based on the determined water level; determining a final rinse step among the at least one rinse step; and performing the final rinse step according to the determined water level, by turning on the first and second water supply valves simultaneously and turning off the second water supply valve after a second predetermined time.

Also, the employed bleaching agent and fabric softener are each provided in liquid form. Thus, the method of the present invention makes use of a siphonic effect applied to the fabric softener reservoir after performing the wash step.

It is to be understood that both the foregoing explanation and the following detailed description of the present invention are exemplary and illustrative and are intended to provide further explanation of the invention as claimed.

BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings, which are included to provide a further understanding of the invention and are incorporated in and constitute a part of this application, illustrate

embodiment(s) of the invention and together with the description serve to explain the principle of the invention. In the drawings:

FIG. **1** is a schematic diagram of a water supply valve system of a washing machine according to a related art;

FIG. **2** is a schematic diagram of a water supply valve system of a washing machine according to the present invention; and

FIGS. **3**A and **3**B are respective sections of a flowchart of a washing machine control method according to the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Reference will now be made in detail to the preferred embodiment of the present invention, examples of which are illustrated in the accompanying drawings. Throughout the drawings, like elements are indicated using the same or similar reference designations where possible.

Referring to FIG. **3**, a water supply valve system of a washing machine according to the present invention includes a detergent reservoir **200** for receiving a detergent for a wash step, a bleaching agent reservoir **400** for receiving a bleaching agent for the wash step, a fabric softener reservoir **600** for receiving a fabric softener for a final rinse step, a first water supply valve **100** for the control of a water supply through the detergent reservoir **200** upon input of a wash command, and a second water supply valve **300** for the control of a water supply to the fabric softener reservoir through the bleaching agent reservoir. The second water supply valve **300** is turned on, simultaneously with the first water supply valve **100**, to provide the bleaching agent and is turned on again at the time of final rinsing.

In accordance with a wash pattern where a bleaching agent is to be supplied together with a detergent for a wash step and a fabric softener is to be supplied only for a final rinse step, the washing machine of the present invention supplies the water for introducing a bleaching agent, upon input of a wash command to initiate the wash step, through the second water supply valve **300** and supplies the water for introducing a fabric softener for the final rinse step. Meanwhile, according to the present invention, the bleaching agent reservoir **400** is arranged between the second water supply valve **300** and the fabric softener reservoir **600**, so that upon initiating the final rinse step, a siphonic effect may be used to transfer water to the fabric softener reservoir through the bleaching agent reservoir. Here, the employed bleaching agent and fabric softener are each provided in liquid form.

Referring to FIGS. **3**A and **3**B, illustrating a washing machine control method according to the present invention, a dry laundry amount is sensed in a step S**11** upon input of a wash command, and a water level H**1** is determined in a step S**12** according to the sensed dry laundry amount. In a step S**13**, the first water supply valve **100** (V**1**) and the second water supply valve **300** (V**2**) are turned on simultaneously for a predetermined time T**1** according to a step S**14**, thus simultaneously introducing the detergent of the detergent reservoir **200** and the bleaching agent of the bleaching agent reservoir **400** to the water for the wash step. In doing so, water is prevented from passing by the fabric softener reservoir **600**. That is, upon initiating the wash step, water is input via the second water valve **300** through the bleaching agent reservoir **400**, to supply the tub with a mixture of water and bleaching agent, but upon reaching the final rinse step, the siphonic effect acting on the fabric softener reservoir **600** causes the water remaining in the bleaching agent reservoir to flow into the fabric softener reservoir, so that a single water supply valve can selectively feed the bleaching agent and fabric softener.

After the lapse of the predetermined time T**1**, the second water supply valve **300** is turned off in a step S**15**. Since the first water supply valve **100** is still on according to the step S**13**, the water level continues to rise until the water level H**1** is reached according to a step S**16**, whereupon washing is performed in a step S**17**. Thereafter, one or more rinse steps are performed according to steps S**18** and S**19**. During washing and rinsing, the water supply valves **100** and **300** are controlled according to a selected wash pattern.

Before performing the final rinse step, however, the first and second water supply valves **100** and **300** are simultaneously turned on in a step S**22** for a second predetermined time T**2** according to a step S**21**, so that water is supplied via the detergent reservoir **200** and via the bleaching agent and fabric softener reservoirs **400** and **600**. Thus, the fabric softener of the fabric soften reservoir **600** is introduced to the water for the final rinse step. Here, the second predetermined time T**2** is preferably longer than the first predetermined time T**1**.

Thereafter, the second water supply valve **300** is turned off in a step S**22**, and the first water supply valve **100** is kept on (according to the step S**20**) until a predetermined water level, consistent with the water level H**1**, is reached according to a step S**23**. Final rinsing is performed in a step S**24**, and a dewatering step is performed in a step S**25**.

As described above, the bleaching agent is used together with the detergent. The first water supply valve **100** is used as a detergent input valve and the second water supply valve **300** is used as a common input valve for a bleaching agent and fabric softener, to introduce the fabric softener in the final rinse step only. Therefore, the present invention uses a single valve for introducing the bleaching agent for washing and for introducing the fabric softener for a rinse step as required. Despite such use of a single valve, the bleaching agent is not mixed with the fabric softener.

It will be apparent to those skilled in the art that various modifications and variations can be made in the present invention without departing from the spirit or scope of the invention. Thus, it is intended that the present invention cover such modifications and variations, provided they come within the scope of the appended claims and their equivalents.

What is claimed is:

1. A washing machine comprising:

a detergent reservoir for receiving a detergent;

a bleaching agent reservoir for receiving a bleaching agent;

a fabric softener reservoir for receiving a fabric softener;

a first water supply valve for supplying water, wherein said first water supply valve is configured to introduce the detergent to a tub;

a second water supply valve for supplying water, wherein said second water supply valve is configured to introduce the bleaching agent and the fabric softener to the tub;

a first conduit connected to the detergent reservoir, wherein the first water supply valve controls water flow through the first conduit and the detergent reservoir; and

a second conduit connected to the bleaching agent reservoir, wherein the second water supply valve controls water flow through the second conduit and the bleaching agent and the fabric softener reservoirs.

2. The washing machine as claimed in claim **1**, wherein said bleaching agent reservoir is arranged between said second water supply valve and said fabric softener reservoir.

3. A method of controlling a washing machine of claim 1, comprising steps of:

determining a water level;

supplying water to a tub according to the determined water level, by turning on the first and second water supply valves and turning off the second water supply valve after a first predetermined time;

performing a wash step and at least one rinse step according to a selected wash course based on the determined water level;

determining a final rinse step among the at least one rinse step; and

performing the final rinse step according to the determined water level, by turning on the first and second water supply valve and turning off the second water supply valve after a second predetermined time.

4. The method as claimed in claim 3, wherein the first predetermined time is shorter than the second predetermined time.

5. The method as claimed in claim 3, wherein the first predetermined time is set to introduce to the water in the tub a detergent from a detergent reservoir and a bleaching agent from a bleaching agent reservoir.

6. The method as claimed in claim 3, wherein the second predetermined time is set to introduce to the water in the tub a fabric softener from a fabric softener reservoir.

7. The method as claimed in claim 6, wherein said final rinse performing step makes use of a siphonic effect applied to the fabric softener reservoir after performing the wash step.

8. The washing machine of claim 1, wherein the first water supply valve is connected to the detergent reservoir.

9. The washing machine of claim 1, wherein the second water supply valve is connected to the bleaching agent reservoir.

10. The washing machine of claim 1, wherein the first and second water supply valves are directly connected to the detergent reservoir and the bleaching agent reservoir, respectively.

11. The washing machine of claim 1, wherein the fabric softener reservoir is directly connected to the bleaching agent reservoir.

12. The washing machine of claim 1, wherein the fabric softener reservoir is connected only to the bleaching agent reservoir and the tub.

13. The washing machine of claim 1, wherein the second water supply valve is configured to selectively introduce the bleaching agent and the fabric softener.

14. The washing machine of claim 1, wherein the second water supply valve is configured to introduce the bleaching agent to the tub upon initiating a washing step.

15. The washing machine of claim 1, wherein the second water supply valve is configured to introduce the fabric softener to the tub upon initiating a final rinsing step.

16. The washing machine of claim 1, wherein the second water supply valve supplies the water to the fabric softener reservoir through the bleaching agent reservoir directly connected thereto for a first predetermined time upon initiating a final rinsing step.

17. The washing machine of claim 16, wherein the water in the bleaching agent reservoir flows into the fabric softener reservoir using a siphonic effect.

18. The washing machine of claim 16, wherein the second water supply valve supplies the water to the bleaching agent reservoir for a second predetermined time upon initiating a washing step, while preventing the water from passing by the fabric softener reservoir.

19. The washing machine of claim 18, wherein the first predetermined time is longer than the second predetermined time.

20. A washing machine including a tub, said washing machine comprising:

a detergent reservoir for receiving a detergent;

a bleaching agent reservoir for receiving a bleaching agent;

a fabric softener reservoir for receiving a fabric softener;

a first water supply valve configured to supply water to the detergent reservoir, thereby introducing the detergent to the tub;

a second water supply valve configured to supply water to the bleaching agent reservoir and the fabric softener reservoir, thereby introducing the bleaching agent and the fabric softener to the tub;

a first conduit connected to the detergent reservoir, wherein the first water supply valve controls water flow through the first conduit and the detergent reservoir; and

a second conduit connected to the bleaching agent reservoir, wherein the second water supply valve controls water flow through the second conduit and the bleaching agent and the fabric softener reservoirs;

wherein the bleaching agent reservoir and the fabric softener reservoir are coupled together.

21. The washing machine of claim 20, wherein the first water supply valve is in the first conduit.

22. The washing machine of claim 20, wherein the second water supply valve is in the second conduit.

* * * * *